

2018 EDUCATION HIGHLIGHTS

Johnson Space Center
External Relations Office



INSPIRE - ENGAGE - EDUCATE - EMPLOY
The Next Generation of Explorers



Johnson Space Center's Office of STEM Engagement

strives to immerse the public in NASA's work, enhance STEM literacy and inspire the next generation to explore.

Johnson is dedicated to inspiring, engaging, educating and employing the next generation of explorers and innovators across three focus areas:

Create unique opportunities for students and the public to contribute to NASA's work in exploration and discovery.

Build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA's people, content and facilities.

Strengthen public understanding by enabling powerful connections to NASA's mission and work.

2018 BY THE NUMBERS



8,113

educators were engaged through hands-on workshops, downlink events and webcasts



547,287
STUDENTS

were engaged through hands-on activities, downlink events and webcasts



1.95 billion

people were reached through social media platforms such as Facebook, Twitter and Instagram



31% of the most recent Pathways class had participated in a NASA STEM engagement activity or Internship



288 interns were placed at Johnson by Johnson's Office of STEM Engagement in FY18 – an increase of nearly 26% from FY17

“
Every training, every discussion
has been taken my back to my
own classroom, where I’ve been
able to successfully carry out
projects and conversations where
every single student makes a
connection, and the learning
becomes meaningful.”

— middle school teacher



EPDC

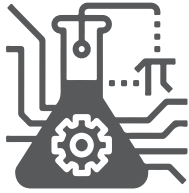
Educator Professional Development Collaborative

The EPDC continues to support the challenge to improve STEM instruction by maintaining a dedicated service of professional development opportunities. Through real-time and self-directed options in face-to-face and online training platforms, educators gain professional growth from options that included digital badges, aerospace-themed webinars, keynote addresses on STEM education pedagogy and live hands-on workshops.

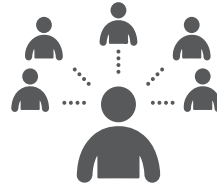
<https://www.txstate-epdc.net/>



METRICS / ACCOMPLISHMENTS



Supported the challenge to improve **STEM instruction** through professional development opportunities



EPDC specialists reached **3,518** K-16 STEM teachers, pre-service teachers and informal educators



Reached an estimated **155,000** people through educator professional development opportunities


- Increased direct face-to-face interactions with educators from 1,041 in FY17 to 3,418 in FY18.

- The EPDC is expanding its scope to include working with students, as well as professional development opportunities for educators.
- The EPDC is implementing a new digital badging system. It will include all of the previously available badges, along with new ones, all aligned to the next-gen pilot themes.
- The EPDC is creating student badges aligned with next-gen themes.
- Upcoming EPDC webinars will be next-gen-theme focused to align with the new pilot and focus of agency priorities.

Next-Gen Themes

- Moon to Mars
- Developing Commercial Crew Program Capabilities
- Small Steps to Giant Leaps





I am generally more of a science person, and HAS really pushed me to try out some engineering aspects. Because of that, I have a better understanding of how it all connects.”

— HAS student

HAS

High School Aerospace Scholars

High School Aerospace Scholars inspires high school juniors from across Texas to explore STEM degrees and careers at NASA. We engage students with a unique NASA experience, where they complete an interactive 16-week online course related to space exploration, Earth science, technology, mathematics and aeronautics. The highest-achieving students are invited to a six-day residential summer experience at Johnson, where they work in teams on a hands-on design challenge and engineering activities to plan a mission to Mars. Students work directly with scientists and engineers, and also take tours of NASA facilities.



255 students participated in the 2018 summer on-site HAS experience



Represented **180** cities and **351** institutions throughout the state of Texas



Female students made up almost **40%** of HAS online course participants




778 students applied for the HAS online 2018-2019 experience

- Created on-demand multimedia resources for students
- Created online discussion boards where students interact with NASA subject-matter experts
- Increased professional development for online training
- Enhanced counselor training, focusing on inquiry-based learning

- More than **270** students were invited to Johnson for a six-day on-site experience that included engineering design challenges, briefings by NASA subject-matter experts and tours of NASA-unique facilities.
- HAS is partnering with the University of Houston (U of H) to enhance the K-12 STEM pipeline, engage the U of H community and create local, state and national educational impact.
- In 2019, HAS will hold a one-day joint effort with the U of H STEM Center, with plans for a future expansion of a pilot week in 2020.



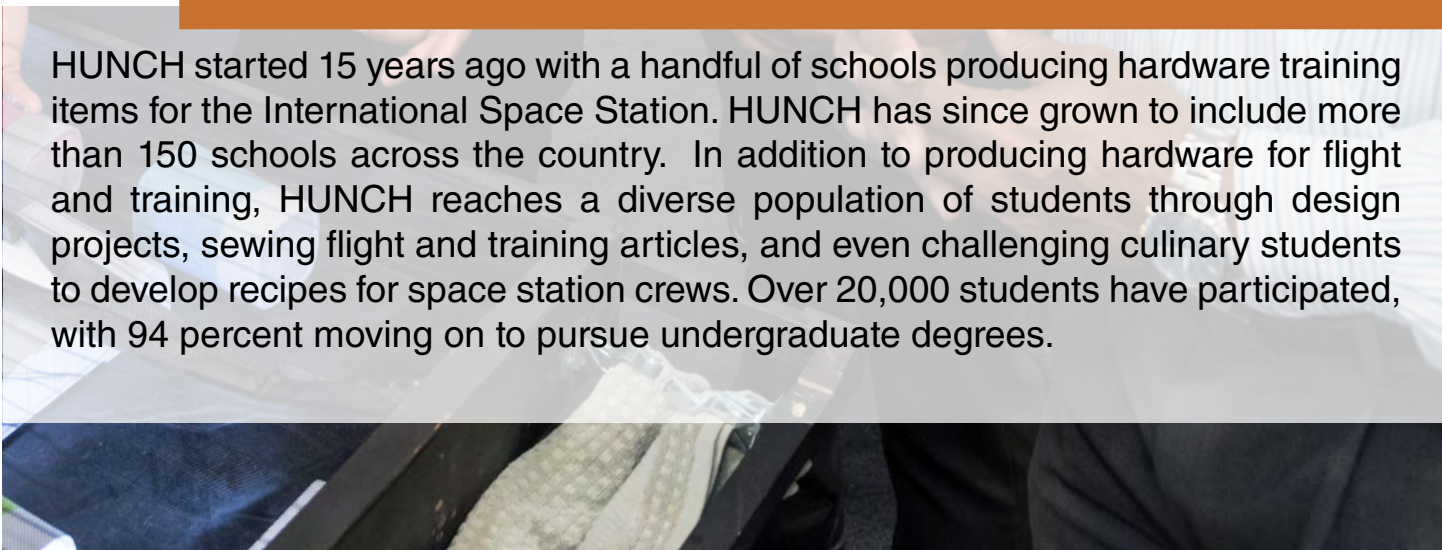


“Being a HUNCH student shaped my post high school career and greatly influenced my academic and career pursuits while also providing me with a network of industry experts that gave me priceless guidance and further insight.”

— HUNCH participant

HUNCH

High School Students United with NASA to Create Hardware



HUNCH started 15 years ago with a handful of schools producing hardware training items for the International Space Station. HUNCH has since grown to include more than 150 schools across the country. In addition to producing hardware for flight and training, HUNCH reaches a diverse population of students through design projects, sewing flight and training articles, and even challenging culinary students to develop recipes for space station crews. Over 20,000 students have participated, with 94 percent moving on to pursue undergraduate degrees.



METRICS / ACCOMPLISHMENTS

Five Challenges Offered

1 DESIGN and PROTOTYPING



Finalists included 216 students from 29 schools in 15 states; several projects are under consideration for flight production

2 CULINARY CHALLENGE



Student-created recipe selected by NASA for inclusion in astronaut meals aboard the International Space Station

3 SPACEFLIGHT HARDWARE



Nearly 900 flight hardware parts have been produced by students at 17 schools nationwide

4 SPACEFLIGHT SOFT GOODS



98 sleeping bag liners, 73 cargo transfer bags, 8 stowage bags and 7 payload caddies were produced for astronauts to use in space, as well as for pre-flight training

5 NASA VIDEO/MEDIA



5 schools competed in this new challenge, producing media showcasing station experiments and HUNCH's role supporting NASA missions

- Recruited a celebrity chef to serve as an expert reviewer for the Culinary Challenge
- Incorporated social media to extend reach to new and diverse audiences

A new partnership will provide students the opportunity to build soft goods supporting missions through the Human Exploration Research Analog, or HERA—a unique habitat designed to serve as an analog for isolation, confinement, and remote conditions in exploration scenarios.



A hardware locker.

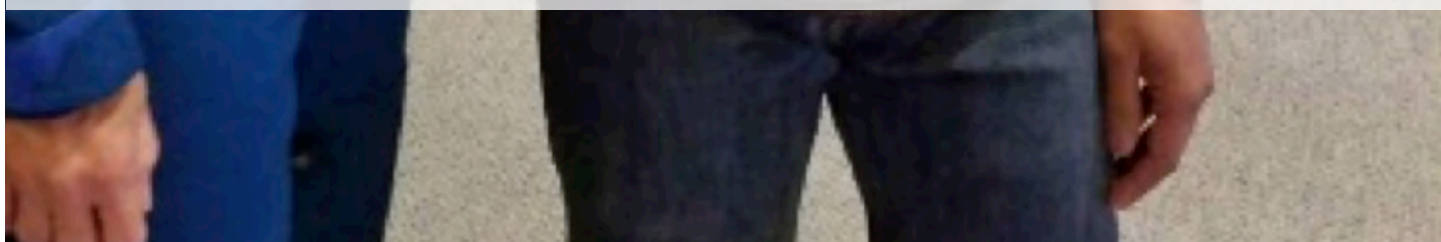


“
The day that I received the call from Johnson Space Center will forever remain one of the defining moments of my life. Finally, the sleepless nights, words of encouragement and struggles endured, are paying off.”

— Xavier Morgan-Lange

INTERNS

Intern coordinators at Johnson and the White Sands Test Facility are ensuring that interns receive degree-relevant experience with improved intern and mentor communications and the submittal of mutual project plans. These project plans and milestone check-ins help further NASA's mission. A focus on providing relevant and meaningful professional development opportunities for students, in collaboration with other NASA education programs and initiatives, has resulted in a strengthened pipeline and contributed to an increased retention rate of participants.





288 students were placed by Johnson's Office of STEM Engagement, an increase of nearly **26%** from FY17



47% of interns placed by Johnson's Office of STEM Engagement include underrepresented in STEM populations



Johnson interns re-created an astronaut training photo from 1997 and **won the agencywide photo challenge**
(See center image below.)




Site visits, program presentations and updated communication products have resulted in an **increase in mentor-funded opportunities**

- Collaboration with other NASA education programs and initiatives has resulted in a strengthened pipeline and contributed to an increased retention rate of participants. Thirty-one percent of the most recent Johnson Pathways cohorts were comprised of students who have participated in the internships program at Johnson/White Sands.
- NASA Internships at Johnson has seen a continual increase in cross-center funding/placements, yielding multiple new internship opportunities this summer at Ames Research Center, Glenn Research Center and NASA Headquarters.

NASA Internships is an agency program managed by Johnson. In FY18, **2,735** interns were placed at all NASA centers and facilities, including NASA Headquarters. NASA Internships are competitive awards designed to identify, cultivate and sustain a diverse workforce by creating educational opportunities for students to contribute directly to NASA's mission. Under the mentorship of renowned scientists and engineers, NASA Internships provide unique research and operational experiences for educators and high school, undergraduate and graduate students.



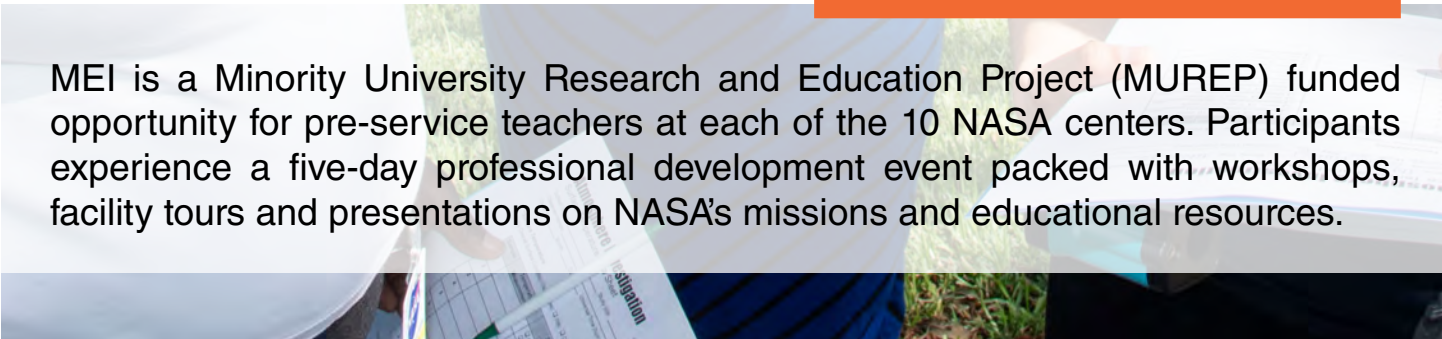
A photograph of three women standing outdoors on a grassy area with trees in the background. The woman in the center is wearing a colorful patterned top and a NASA visitor badge. The woman on the right is wearing a dark blue shirt with "NASA SPACE CENTER" visible. The woman on the left is wearing a white shirt and glasses.

“The MEI was an excellent experience. I now have a significantly enriched and expanded awareness of how to use the 5E Lesson Plan and Next Generation Science Standards and Engineering Design Process to design learning activities for teacher candidates in my Curriculum and Methods courses.”

— MEI faculty sponsor

MEI

MUREP Educator Institutes

A background image showing people working on documents and forms, with one document titled "Registration" visible.

MEI is a Minority University Research and Education Project (MUREP) funded opportunity for pre-service teachers at each of the 10 NASA centers. Participants experience a five-day professional development event packed with workshops, facility tours and presentations on NASA's missions and educational resources.

<https://www.txstate-epdc.net/nasa-mei/>



86 students and faculty sponsors from minority-serving institutions participated



Participants represented **17** colleges and universities across the region serviced by Johnson



MEI faculty introduced more than **2,900** college students to NASA content and resources

- 100 percent of faculty sponsors used NASA resources in their teachings since returning from MEI, including in 129 sections of university courses
- Participants completed 16 hours of pre and post-institute badges consisting of webinars, meetings, institute reflections and teaching a hands-on lesson
- MEI faculty sponsors impacted almost 2,200 colleagues through professional development events at their home institutions
- 53 percent of faculty sponsors went on to participate in NASA webinars, 43 percent pursued NASA EPDC digital badges, 20 percent attend one or more additional events at a NASA center, and 4 percent pursued a NASA internship
- 75 percent of pre-service teacher participants report using NASA resources in their teachings after MEI
- 84 percent of pre-service teacher participants report their students engaged, or highly engaged, in NASA activities
- Pre-service MEI participants introduced nearly 14,500 students to NASA content and resources
- Pre-service MEI participants also went on to engage in additional NASA professional development opportunities



“

We try to do real engineering
... that's why this has been
amazing, because this is
unbelievably real. ”

— MgUE participant



MgUE

Microgravity University for Educators

MgUE challenges student and educator teams to solve technical problems by designing, building and testing prototypes in a simulated microgravity environment – the Precision Air Bearing Floor (PABF). NASA scientists and engineers challenged students to engineer and code devices that could launch a projectile to meet a moving target, mocking a Mars orbital insertion. NASA mentors helped student teams integrate their solutions with the PABF. Students and educators participated in many learning opportunities, including webinars, tours of NASA facilities, briefings from NASA subject-matter experts, NASA-unique experiences such as rovers and partial-gravity simulations and professional development, online and on-site.



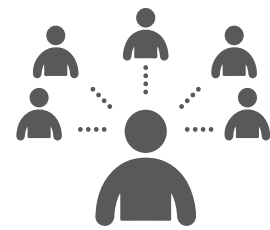
<https://microgravityuniversity.jsc.nasa.gov/>



54 students and educators tested their prototype on the Precision Air Bearing Floor



9 teams from **6** states and Puerto Rico attended the two test weeks at Johnson



Participating educators reported that **110K+** individuals were indirectly involved in their MgUE experience



SOCIAL MEDIA

- Invited students to Johnson to test their prototypes with their educators
- Incorporated a microgravity digital badge into the professional educator development

#NASAMGUE reached nearly **9 million** people on social media.





“
I believe the work I completed
helped develop me as an engineer,
and that the Micro-g NExT
project facilitated my interest and
involvement for a future career in
the aerospace industry.”

— Micro-g NExT student

Micro-g NExT

Microgravity Neutral Buoyancy Experimental Design Teams

Micro-g NExT challenges undergraduate students to design, build and test a tool or device addressing an authentic, current space exploration challenge. The overall experience includes hands-on engineering design, test operations and public outreach. Student teams traveled to Johnson to test their tools in the simulated microgravity environment of the Neutral Buoyancy Laboratory (NBL) – a 6.2-million-gallon pool used for astronaut training.



239 students and faculty participated in the Micro-g NExT online community



142 students traveled to Johnson to test their tool in the NBL



Participants represented **22** colleges and universities in **17** states, **4** minority-serving institutions and **1** community college

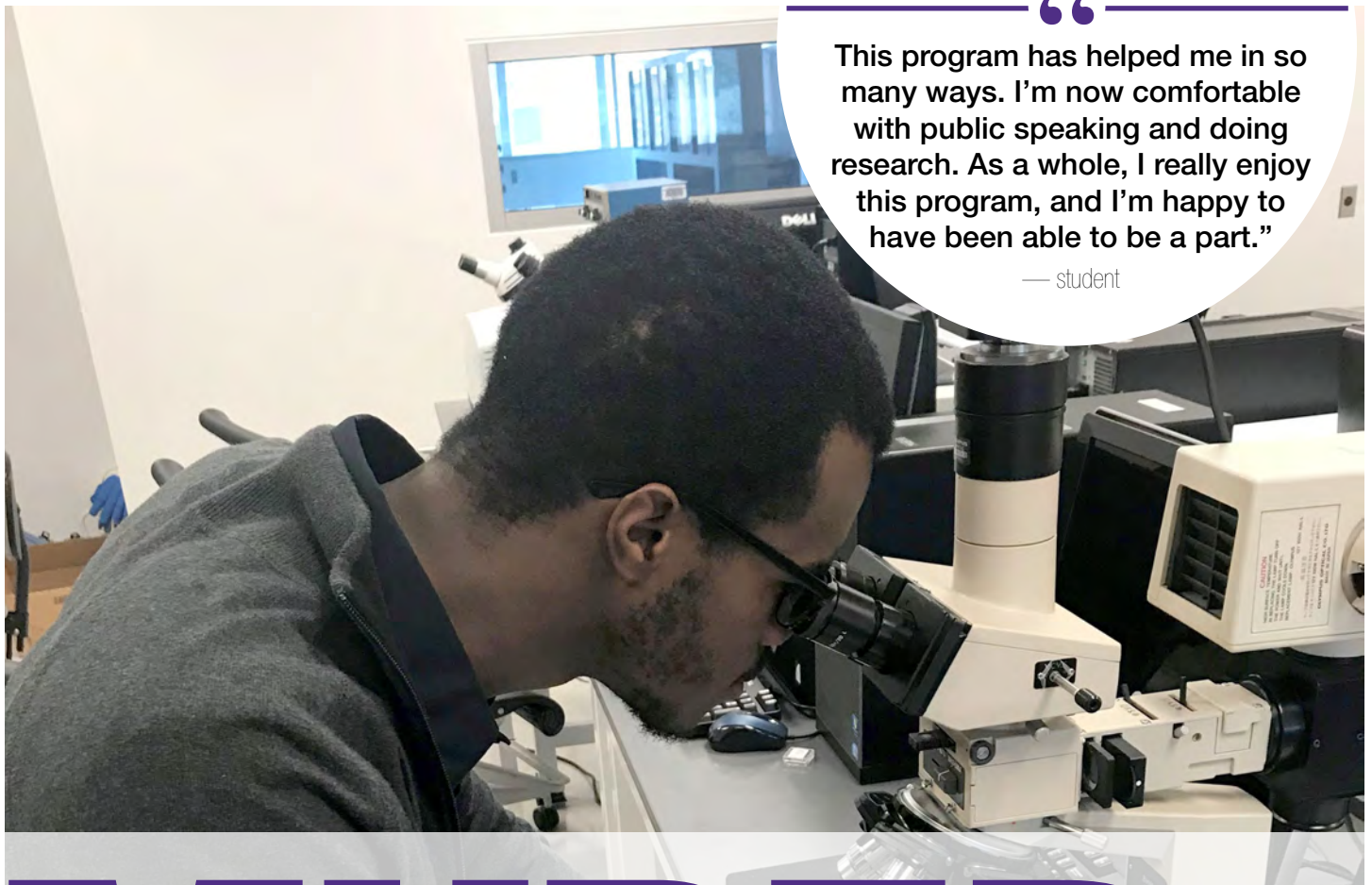


Students participated in **9** online sessions with NASA subject-matter experts

- Audited processes and changed milestone due dates to support a more rigorous technical review by NASA subject-matter experts
- Collaborated with the Jet Propulsion Laboratory to develop a challenge addressing sampling missions on planetary bodies using the Buoyant Rover for Under Ice Exploration (BRUIE) as a platform
- Developed four new challenges: Module Leak Repair System; Sharp Edge Detection and Removal/Covering; Extravehicular Activity (EVA) Zip Tie Cutters; and Under Ice Sampling Device

Micro-g NExT will continue collaborating with NASA scientists and engineers to develop future challenges that are current and relevant to NASA missions.





“This program has helped me in so many ways. I’m now comfortable with public speaking and doing research. As a whole, I really enjoy this program, and I’m happy to have been able to be a part.”

— student

MUREP

Minority University Research and Education Program

MUREP engages underrepresented populations through a wide variety of initiatives. Multi-year grants are awarded to assist minority-institution faculty and students in their research of pertinent missions.

<https://www.nasa.gov/offices/education/programs/national/murep/home/index.html>

MUREP MOO



Provided **1,157**
students with
significant, direct
student awards in
higher education

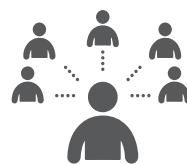


Impacted **4,900**
students and **595**
educators through
MOO awardee
outreach events

MUREP Other Opportunities (MOO) awards six minority-serving institutions with NASA funding and support to innovatively create and implement STEM opportunities designed to attract, retain and support the success of underrepresented students in STEM degree programs.



MUREP MIRO



UTEP MIRO served more
than **1,976** K-12 students
through outreach activities

MUREP Institutional Research Opportunity (MIRO) aims to strengthen and develop the research capacity of minority-serving institutions (MSIs) in areas of value to NASA's mission. NASA invites MSIs to submit research proposals based on current NASA needs. Selected institutions receive funding, support from NASA subject-matter experts and internships for students working on the research project.

MUREP MAIANSE

The long-range goal is to increase the number of Native American students who pursue careers in IT and STEM disciplines. The short-term goal is to document improvement in IT skills and STEM understanding of the students who are participating. A key element is creating a curriculum for predominantly Native-American-serving high schools.



At the Southwest Indian
Polytechnic Institute
Engineering programs
enrollment is
up 20 to 25%



NCAS

NASA Community College Aerospace Scholars

NCAS is an agencywide MUREP-funded activity that engages community college students in NASA's missions and encourages them to finish a two-year degree or transfer to a four-year university to pursue a STEM field or career.



<http://ncas.aerospacescholars.org/>



More than **1,200** students participated in the NCAS online community



79% invitations for on-site experience issued to MSI-attending students

29% increase in female participants



Conducted **20** on-site experiences at **10** NASA centers, reaching **757** students



Partnered with MAIANSE to host competition at AIHEC, reaching **30+** tribal college students, faculty and tribal elders

- Implemented communication-enhancing technology to increase application completion rate and lower attrition rate in the NCAS online community
- Created peer-mentor element with outstanding NCAS alumni during NCAS on-site experience
- Enhanced NCAS staffing model with three regional education coordinators nationwide
- Expanded NCAS on-site experience to all NASA centers
- NCAS recruitment strategy resulted in a 30 percent increase in the number of students coming from minority-serving institutions
- NCAS worked strategically with Public Affairs officers at all 10 NASA centers to amplify social posts on NASA and NASA Education accounts. This new strategy obliterated the 2017 record of 89.9M, with an 89 percent increase in overall reach to 169.7M with the single hashtag #NCAS2018




“I am committed to advocating [NCAS]. Sam and Kristen have broadened their sense of possibilities and their sense of confidence as a result. This strengthening of their confidence is priceless.

— community college professor

20 on-sites scheduled and six community colleges are participating in an NCAS on-campus pilot activity.





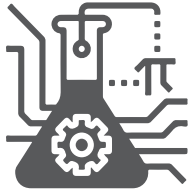
“The experience gained by future engineers designing to meet requirements and standards, adhering to schedules and working in an operational environment, will help them find a career.”

— WB-57 program manager

SOAR

Student Opportunities in Airborne Research

SOAR is a design challenge that uses NASA WB-57 high-altitude aircraft. The activity targets specific technical needs in airborne research as identified by Johnson Flight Operations. SOAR challenges undergraduate students to design and test experiments related to atmospheric and ground mapping, cosmic dust collection, thermal management and control systems, rocket launch support, and test bed operations for future airborne – or space-borne – systems.



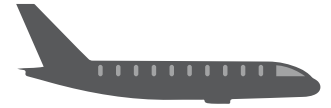
Experiments included research related to DNA, radiation exposure, urban traffic patterns and environmental data recorders



130 participants in the pilot year



43% of participants represented minority-serving institutions



50+ students traveled to Johnson to test their experiments



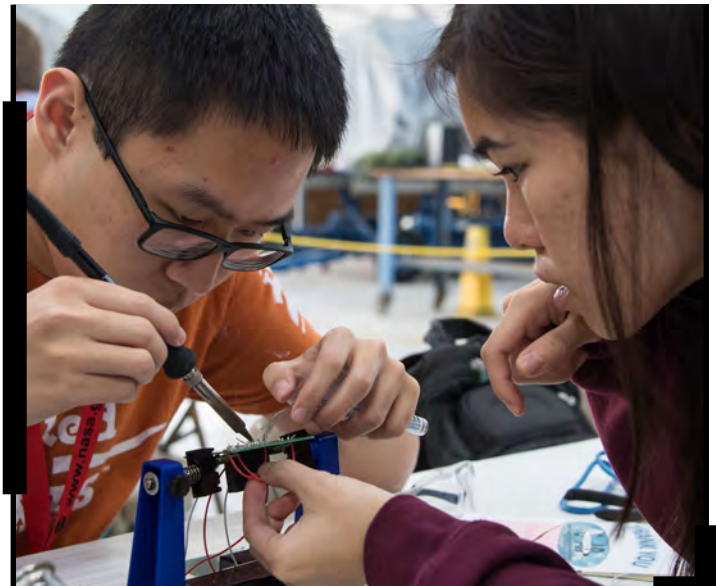
MISSION BENEFIT

- Provided a space-equivalent zone test lab for students to contribute results to a mission
- Student-derived solutions lead to state-of-the-art advancements in science missions and further benefits to humanity
- Students **MULTIPLY** the effort of the NASA workforce toward meeting NASA mission goals at a reduced cost
- This activity targets mission-critical skills that NASA contractors currently practice
- SOAR sets up the future workforce with the tools and training needed to be successful in engineering



SOCIAL MEDIA

#NASASOAR reached more than **8 million** people on social media during the launch of year one.



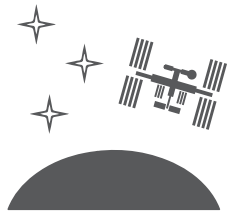
“

In the words of Astro Joe from my downlink question, ‘It was hard. We struggled EVERY DAY!!!’ We quote him EVERY, SINGLE DAY because my kiddos here in the middle of nowhere New Mexico struggle, too!”

— New Mexico
science teacher

SOS STEM on Station

STEM on Station uses the International Space Station (ISS), its crew and onboard research to inspire, engage and educate students and educators. SoS works to advance NASA and the nation’s STEM education and workforce pipeline through NASA’s missions and unique assets, including a comprehensive website, conversations with astronauts in space and hands-on STEM activities developed through high-profile partnerships.



Coordinated **62** in-flight education downlinks between astronauts aboard the station and students in **27** states + Puerto Rico, Washington, D.C. and Canada



Downlinks reached **87K+** educators and **237K+** students



Downlinks increased by **226%** — yielding the highest number of education events in the history of the space station



The SoS website is one of NASA Education's most visited websites, exceeding **75K+** views in October

- Collaborated with the ISS Science Program Office in providing astronaut talking points for research-based questions during in-flight education downlinks
- Created and implemented an automated process to track milestones on multiple in-flight education downlink events
- Partnered with the NASA TV production staff to enhance in-flight education downlinks with visually interesting graphics and props



“He was able to show our kids the skills he is using in space apply to what we are trying to do in our STEM program – things such as being a creative thinker, a problem solver, and having grit to get through when things are tough.

— school principal





Next generation of explorers working on the next generation of spacesuits: inspiring to see student design ideas for new spacewalking hardware.”

— Astronaut Kate Rubins

SUITS

NASA Spacesuit User Interface Technologies for Students

NASA SUITS is a mission-driven design challenge where college student teams design and create spacesuit informatics using an augmented reality (AR) platform – Microsoft HoloLens. Spacesuit avionic informatics help astronauts become more efficient and effective during a spacewalk, often in the form of visual displays. The student-designed visual display and audio environments present information to aid astronauts in the performance of simulated spacewalk tasks. After developing their environment, selected student teams traveled to Johnson to test their prototypes.



Launched first mission-driven **coding challenge** for Johnson's Office of STEM Engagement while developing a new partnership with the Extravehicular Office



60+ institutions submitted letters of intent



The **10** participating institutions included a community college and **2** minority-serving institutions



130 students and faculty participated in the online course, and **48** students and faculty tested prototypes at Johnson

- Research and pursue future funding opportunities
- Continue to build internal and external partnerships
- Expand activity timeline
- Provide more time for collaboration and software updates between prototype testing

#NASACodes and **#NASASUITS** reached more than **15 million** people on social media during its pilot year.





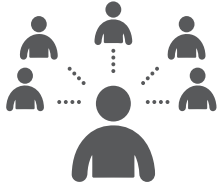
“Now this is what we call a great educational video. I seriously want more of this.”

— educator

YES

Year of Education on Station

The September 2017 launch of astronaut and former classroom teacher Joe Acaba kicked off a Year of Education on Station, NASA's celebration of an almost constant presence of an educator aboard the International Space Station. Acaba was aboard the station through February 2018, and fellow teacher and astronaut Ricky Arnold launched in March 2018 and remained aboard through early October 2018. Due to an increase in crew time dedicated to educational activities, YES included opportunities for thousands of students and teachers nationwide to speak directly with astronauts through in-flight education downlinks. Another component of YES was a series of lessons from space called “STEMonstrations,” which aligned with Next Generation Science Standards.



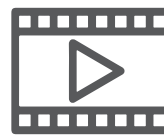
Collaborated with all
NASA centers and activities
an agencywide
implementing campaign



Partnered with industry powerhouses
**Challenger Center,
Microsoft and NSTA,**
extending the reach of YES



Implemented the
#ThankATeacher social media
campaign — the hashtag received more
than **177,250,500** views



Released
8 STEMonstrations
and corresponding lessons/multimedia
designed as grab-and-go packages
for educators

#TeacherOnBoard reached more than
856 million people on social media

- Continue script development, filming and editing for up to 10 additional STEMonstrations.
- Fulfill the partnership commitment with the Challenger Center to film Christa McAuliffe's "lost lessons." As part of YES, Teacher in Space McAuliffe's "lost lessons" were recorded on orbit as a tribute to her legacy and for teachers around the world.



"This was a very
concise explanation
of the second law of
motion, which can be
a little tough to grasp.

— educator





"I am committed to advocating for the program. My students have broadened their sense of possibilities and their sense of confidence as a result. This strengthening of their confidence is priceless.

— community college faculty





Johnson's Office
of STEM Engagement
uses NASA's unique
capabilities to advance
STEM education
and human space
exploration.



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